

CLAIMS

1.       A magnetic random access memory comprising:  
          a plurality of magnetoresistance elements  
          having magnetic anisotropy directed in a first  
5   direction;  
          a wiring provided to extend in a second  
          direction different from said first direction; and  
          a yoke layer formed of ferromagnetic  
          material, extended in said second direction, and  
10   covering at least portion of a surface of said wiring;  
          wherein said plurality of magnetoresistance  
          elements include:  
          a first magnetoresistance element;  
          a second magnetoresistance element whose  
15   distance from an end of said yoke layer in the second  
          direction is larger than that of said first  
          magnetoresistance element,  
          wherein said magnetic anisotropy of said  
          first magnetoresistance element is stronger than said  
20   magnetic anisotropy of said second magnetoresistance  
          element.
2.       The magnetic random access memory according  
          to claim 1, wherein a first aspect ratio defined as a  
25   ratio of a length of said first magnetoresistance  
          element in said first direction to a width of said  
          first magnetoresistance element in said second

direction is larger than a second aspect ratio defined as a ratio of a length of said second magnetoresistance element in said first direction to a width of said second magnetoresistance element in said  
5 second direction.

3. A magnetic random access memory comprising:  
a magnetoresistance element;  
a first wiring through which a write current  
10 is flown for writing data into said magnetoresistance element;  
a first yoke layer formed of ferromagnetic material, extended in said first direction, and covering at least portion of a surface of said wiring;  
15 a magnetic field control structure introducing a magnetic field developed by magnetic poles appearing at ends of said first yoke layer in said first direction away from said magnetoresistance element.

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4. The magnetic random access memory according to claim 3, wherein said magnetic field control structure includes a magnetic shielding structure positioned between said ends of said first yoke layer  
25 and said magnetoresistance element.

5. The magnetic random access memory according

to claim 4, wherein said magnetic shielding structure obliquely intersects said first wiring.

6.       The magnetic random access memory according  
5 to claim 5, wherein said magnetic shielding structure has a same stack structure as at least a portion of said magnetoresistance element.

7.       The magnetic random access memory according  
10 to claim 4, further comprising:

          a second wiring which is not used for writing data into any magnetoresistance elements within said magnetic random access memory, said second wiring being provided to extend in a direction different from  
15 said first direction and positioned between said end of said yoke layer and said magnetoresistance element;  
and

          a second yoke layer covering at least a portion of a surface of said second wiring,  
20       wherein said second yoke layer functions as said magnetic shielding structure.

8.       The magnetic random access memory according to claim 3, further comprising:

25       a spacer layer covering said first yoke layer,  
          wherein said magnetic field control structure

includes a magnetic layer covering said spacer layer,  
and

wherein said magnetic layer introduces a  
magnetic field emitted from one of said ends of said  
5 first yoke layer into another of said ends of said  
first yoke layer.

9. The magnetic random access memory according  
to claim 8, wherein magnetizations of said first yoke  
10 layer and said magnetic layer are directed in opposite  
directions.

10. The magnetic random access memory according  
to claim 9, wherein said spacer layer is formed so as  
15 to provide antiferromagnetic coupling between said  
first yoke layer and said magnetic layer.

11. The magnetic random access memory according  
to claim 3, further comprising:

20 a second interconnection provided to extend  
in said first direction; and

a second yoke layer formed of ferromagnetic  
material, extended in said first direction, and  
covering at least portion of a surface of said second  
25 wiring,

wherein said magnetic field control structure  
includes a magnetic member magnetically connecting

said first and second yoke layers.

12.       The magnetic random access memory according  
to claim 11, wherein said second wiring is adjacent to  
5 said first wiring in a second direction orthogonal to  
said first direction, and

wherein said magnetic member includes:

          a first magnetic member magnetically  
connecting one end of said first yoke layer with one  
10 end of said second yoke layer; and

          a second magnetic member magnetically  
connecting another end of said first yoke layer with  
another end of said second yoke layer.

15 13.       The magnetic random access memory according  
to claim 12, further comprising:

          a third magnetic member disposed between said  
first and second magnetic members;

          a fourth magnetic member positioned on an  
20 opposite side of said magnetoresistance element with  
respect to said third magnetic member, disposed  
between said first and second magnetic members.

14.       The magnetic random access memory according  
25 to claim 11, wherein said second wiring is adjacent to  
said first wiring in said first direction.

15.       The magnetic random access memory according to claim 3, further comprising:

          a second wiring provided to extend in said first direction, and adjoining said first wiring in  
5 said first direction; and

          a second yoke layer formed of ferromagnetic material, extended in said first direction, and covering at least portion of a surface of said second wiring,

10       wherein said second yoke layer functions as said magnetic field control structure, arranged close to said first yoke layer so that said second yoke layer is magnetically connected with said first yoke layer.

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16.       A magnetic random access memory comprising:  
          a magnetoresistance element;

          a wiring through which a write current is flown for writing data into said magnetoresistance  
20 element; and

          a yoke layer formed of ferromagnetic material, extended in a direction in which said wiring is extended, and covering at least portion of a surface of said second wiring,

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          wherein an end of said yoke layer is positioned sufficiently far away so that a magnetic field emitted from said end exerts substantially no

effect on characteristics of said magnetoresistance element.

17.       A magnetic random access memory comprising:  
5           magnetoresistance elements arranged in rows  
and columns;  
          a wiring through which a write current is  
flown for writing data into said magnetoresistance  
elements; and  
10          a yoke layer formed of ferromagnetic  
material, extended in a direction in which said wiring  
is extended, and covering at least portion of a  
surface of said second wiring,  
          wherein an end of said yoke layer is  
15 positioned away from a nearest magnetoresistance  
element so that an intensity of a magnetic field which  
a magnetic pole appears at said end applies to said  
nearest magnetoresistance element is reduced down to  
or less of one-fifth of an intrinsic coercive field of  
20 free ferromagnetic layers within said  
magnetoresistance elements, said nearest  
magnetoresistance element being one of said  
magnetoresistance elements closest to said end.

- 25 18.       A magnetic random access memory comprising:  
          a plurality of first wirings extending in a  
first direction;

a plurality of second wirings disposed to extend in a second direction different from said first direction;

first yoke layers covering at least portions  
5 of said respective first wirings; and

magnetoresistance elements arranged at respective intersections of said first and second wirings,

wherein first ends of said first yoke layers  
10 in said first direction are positioned away from nearest magnetoresistance elements so that distances from said nearest magnetoresistance elements to said first ends are equal to or more than a minimum pitch of said second wirings, said nearest magnetoresistance  
15 elements being ones of said magnetoresistance elements positioned nearest to said first ends.